UP 2015 - Box for indoor installations

This document describes the indoor installations of the UP 2015, the Remote Terminal Unit for telecontrol and supervision of Medium Voltage distribution network; it provides functional and construction requirements for the provision.

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INDEX

0 ACRONYMS 4
1 INTRODUCTION 4
2 LIST OF COMPONENTS, PRODUCT FAMILY OR SOLUTIONS TO WHICH THE GS APPLIES .. 5
3 APPLICABLE LAWS, REFERENCE STANDARDS AND LIST OF REPLACED STANDARDS 6
4 CONSTRUCTION CHARACTERISTICS 6
4.1 INDOOR BOX – WALL-MOUNTED VERSION 6
4.2 INDOOR BOX – CEILING-MOUNTED VERSION. 11
5 EQUIPMENT 13
5.1 PSBC 13
5.2 UE 13
5.3 BATTERIES 13
5.4 COMMUNICATION MODULE 13
5.5 AMBIENT TEMPERATURE PROBE 14
5.6 CABLES AND TERMINAL BOARD 14
6 TESTING AND INSPECTION 16
6.1 TYPE TESTS 16
6.1.1 Visual inspection 16
6.1.2 Check of all connections 16
6.1.3 Mechanical tests 17
6.2 ACCEPTANCE TESTS 17
7 FASTENING SYSTEMS 18
7.1 WALL-MOUNTING 18
7.2 CEILING-MOUNTING 18
8 AMBIENT OPERATING CONDITIONS 18
9 EQUIPMENT DOCUMENTATION 19

0 Acronyms

CM	Ceiling-Mounted
CPE	Customer Premises Equipment
DFPI	Directional Fault Passage Indicator
IC	Customer Interface device
LVI	Line Voltage Indicator
LVCB	Low Voltage Circuit Breaker
PSBC	Power Supply Battery Charger
RGDAT	directional fault passage and voltage loss indicator
RGDM	directional fault passage indicator with measuring acquisition
Recloser	switch breaker with an integrated control module
RTU	Remote Terminal Unit for the remote control of the secondary substations
SD	Switch Disconnector
TB	Terminal Board
UE	Processing Unit of the RTU
WM	Wall-Mounted

1 Introduction

This document describes the indoor box containers for a Remote Terminal Unit (see GSTR001/1 specification), which is able to control/monitor switchgears such as Switch Disconnectors (SDs), Secondary Substation Circuit-Breakers (SSCBs), Reclosers and Low Voltage motor-driven Circuit Breakers (LVCBs) of the secondary substation.

2 List of components, product family or solutions to which the GS applies

Two versions of the indoor cabinet container can be provided, namely, the wall-mounted version (WM-UP, as demonstrated in Figure 1, Figure 2), and the ceiling-mounted version (CM-UP, as demonstrated in Figure 3), each associated to a different product family code.

Solution	Product family code	Description
WM-UP8		Wall-mounted indoor cabinet container (Figure 1)
WM-UP16		Wall-mounted indoor cabinet container (Figure 2)
CM-UP		Ceiling-mounted indoor cabinet container (Figure 3)

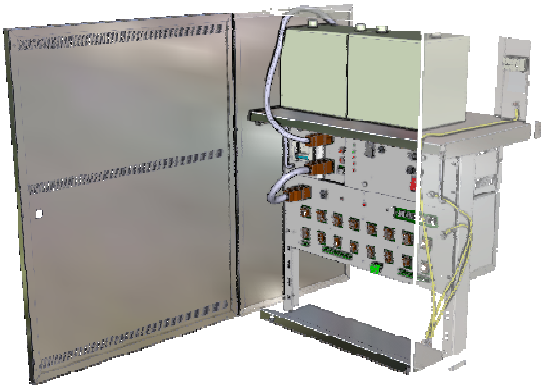


Figure 1 – WM-UP8

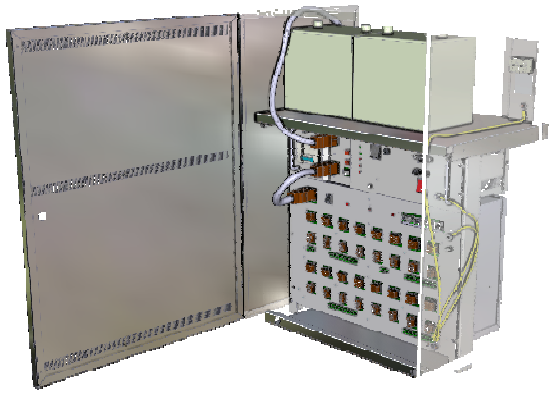


Figure 2 – WM-UP16

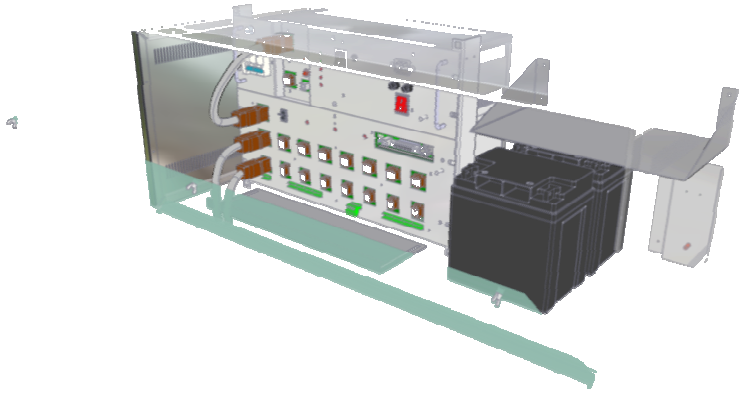


Figure 3 – CM-UP

Accessories	Solution	Description	Supplied
PSBC	WM-UP8/WM-UP16/ CM-UP	Power supply/ battery charger of the RTU, switchgears and auxiliary devices (modem, router, etc.) whit accessories	Yes
UE8	WM-UP8/ CM-UP	Apparatus for teleoperation for 8 switchgears whit accessories	Yes
UE16	WM-UP	Apparatus for teleoperation for 16 switchgears	Yes
Batteries	WM-UP8/WM-UP16/ CM-UP	Batteries in compliance with the global specifications on batteries for secondary stations	No
GSM/GPRS Modem	WM-UP8/WM-UP16/ CM-UP	DCE for the remote connection	No
PSBC-BATT/TB-AUX	WM-UP8/WM-UP16/ CM-UP	Connection cable among PSBC Batteries and TB-AUX	Yes
TB-AUX	WM-UP8/WM-UP16/ CM-UP	Terminals board for the auxiliary power supplies	Yes
CM-S	CM-UP	Support for ceiling-mounting	Yes
Temperature probe	WM-UP8/WM-UP16/ CM-UP	Probe for ambient temperature measurement	Yes

3 Applicable laws, reference standards and list of replaced standards

IEC 60068-2-6:2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)
IEC 60068-2-64:2008	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance
GSTR001/1	Remote Terminal Unit for secondary substations (UP 2015)

4 Construction characteristics

4.1 Indoor box – wall-mounted version

The cabinet container is a 19” rack, accessible from the front, with a height equal to 15 U.

The metallic container must be provided with a 6 MA grounding bolt (on the right side) to which ground and the +24 V_{DC} power supply will be connected.

The container must be fixed to the wall through dowels of 10 mm diameter (each cabinet must include the drilling jig). The rear of the cabinet must be equipped with spacers, in order to create a space between the fixing panel and the wall.

The front door must be hinged on a side, and equipped with a door-lock without key and of ventilation slots for air circulation.

Two shelves are located in the container, as shown in Figure 4

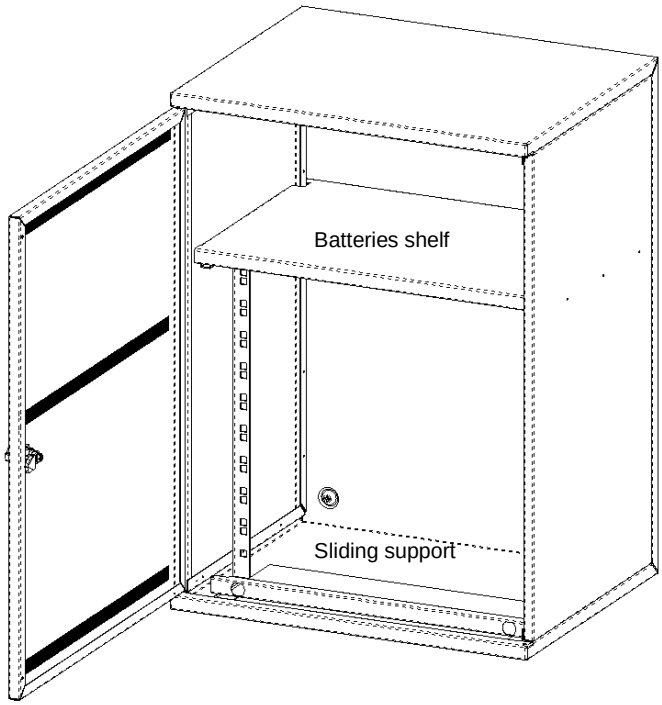


Figure 4 – WM-UP8/UP16 Cabinet container overview

On the upper side of the cabinet, there must be a case with a height equal to 5U (222,25 mm), borders not included, utilized in order to contain two batteries, in compliance with the global specifications on batteries for secondary substations.

Inside this case, a terminal board must be located, for the connection of the 12 V_{DC} (ungrounded) and 24 V_{DC} (with positive grounded) auxiliary supplies. The terminal board must be easily accessible from the front (it cannot be positioned at the rear of the container), even if the batteries are in the case: it can be positioned on a support, on the right side of the cabinet (other solutions can be accepted, if agreed upon in advance with ENEL). The support must not have any protruding or sharp edges and allow for the installation and replacement operations on the batteries to be executed in complete safety.

The DCE will be housed outside the container, or, rather, on the right side of the batteries, in correspondence of the terminal board of the auxiliary supplies.

The second shelf, which represents the bottom of the cabinet container, must be provided with a sliding support for cable fixing. The opening clearance must be sufficient in order to ensure either the fastening of all of the cable for field interface, the input AC power supply, or the power supply to the DCE, etc. The removable support must be equipped with a protective sealing and fixing screws.

Figure 5, Figure 6, and Figure 7 provide the maximum dimension and the main sizes of the wall-mounted cabinet container.

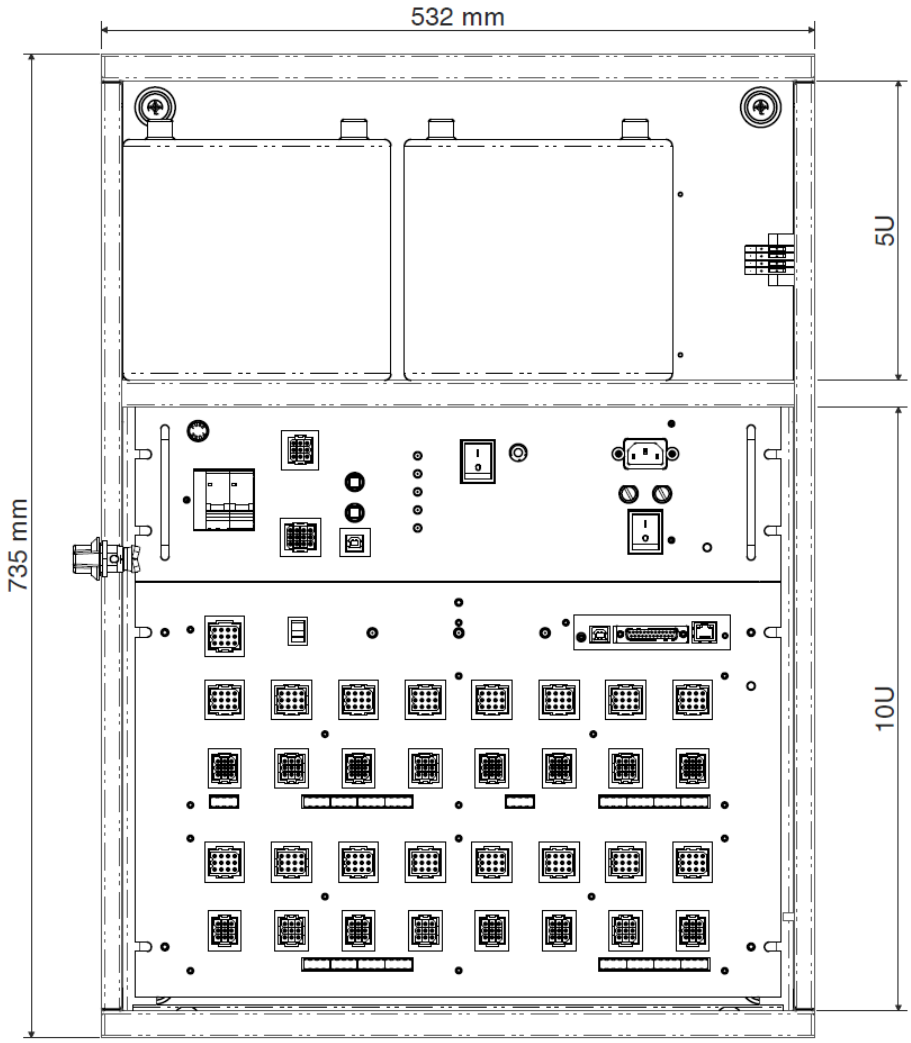


Figure 5 – Front view of the indoor WM-UP8/UP16 Cabinet container (with UE16 version mounted inside)

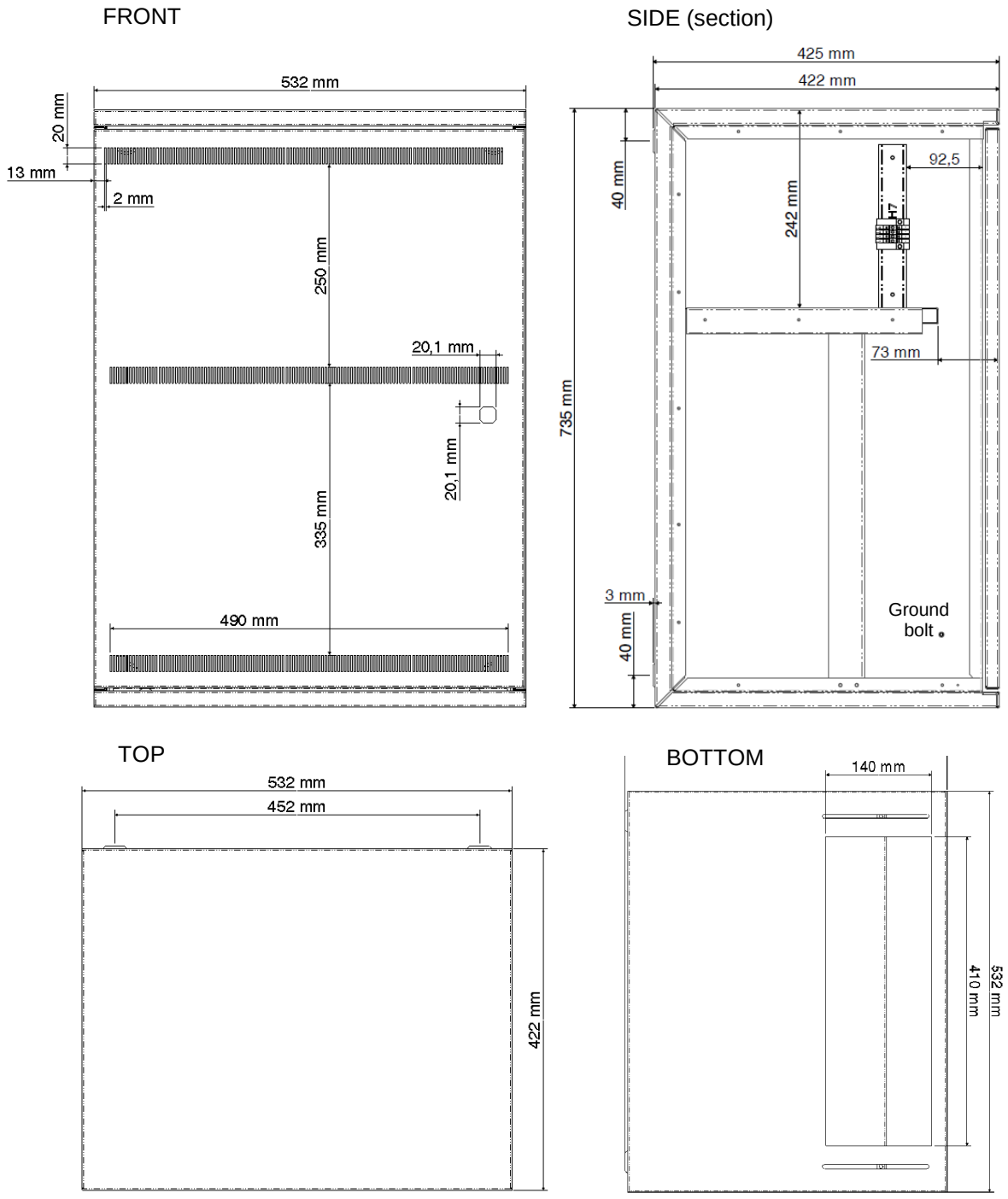


Figure 6 – Front, Side, Top and Bottom views of the indoor WM-UP8/UP16 Cabinet container

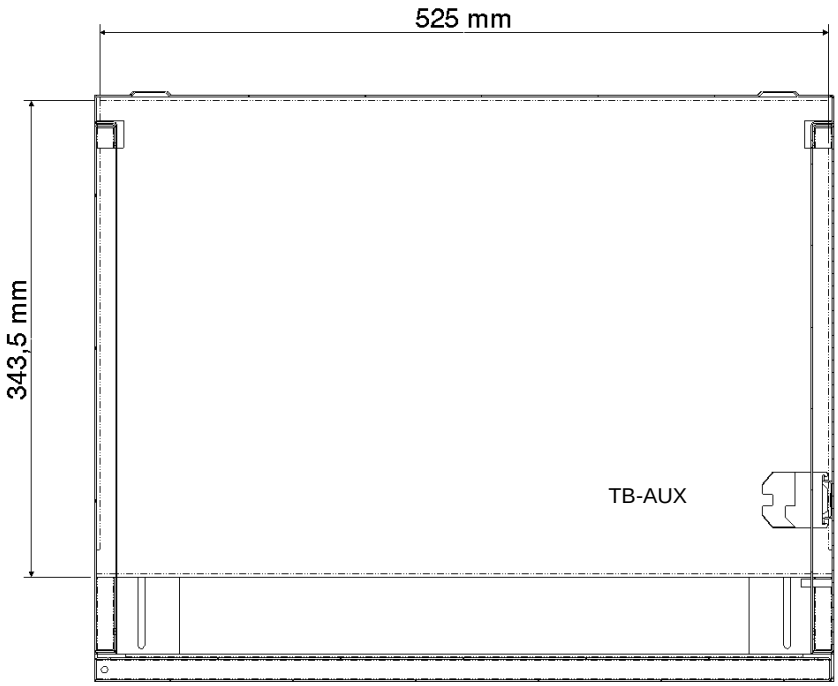


Figure 7- Battery shelf (section)

4.2 Indoor box – ceiling-mounted version.

The ceiling-mounted version must be manufactured for the mounting in the secondary substations, where a reduced space of the equipment is required. The cabinet container must be made for ceiling fixing. The fixing structure must allow for the even distribution of the UE weight. The cabinet container is designed in order to host the UE8 version only.

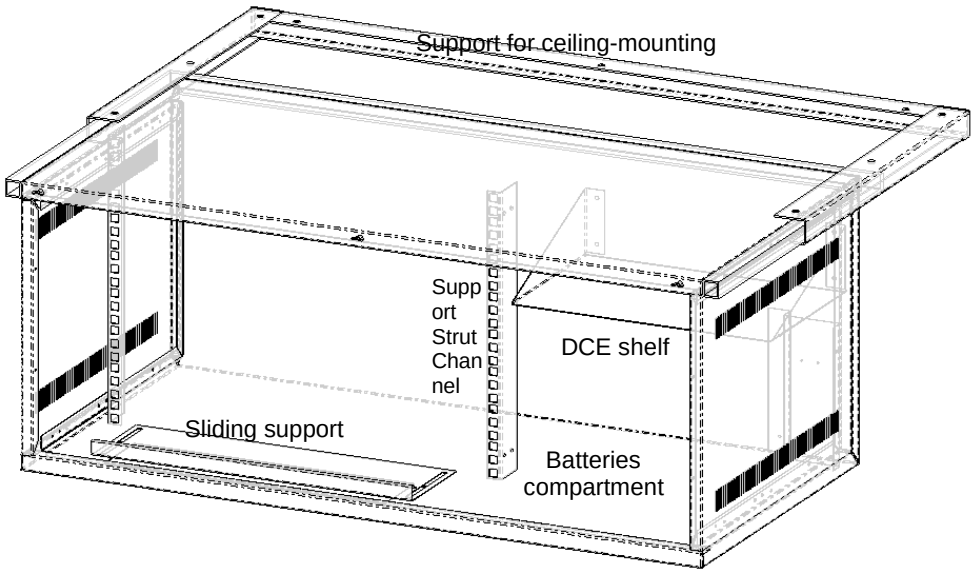


Figure 8 – Overview of the CM-UP outdoor cabinet container (example)

The cabinet container is arranged on two columns, accessible from the front by a removable panel, of dimensions equal to those shown in Figure 8. The container must ensure an IP3X degree of protection, except for the bottom.

The metallic container must be provided with a 6 MA grounding bolt (on the right side) to which ground and the +24 V_{DC} power supply will be connected.

Batteries are hosted on the bottom of the cabinet container, into an appropriate compartment, on the right side. A terminal board must be located in the rear left side, for the connection of the 12 V_{DC} (ungrounded) and 24 V_{DC} (with positive grounded) auxiliary supplies.

A shelf for the housing of the DCE must be fixed above the batteries.

The cabinet container is suitable for ceiling-mounting through the fastening system proposed in the following chapter 7.

Figure 9, Figure 10 provide the maximum dimension and the main sizes of the ceiling-mounted cabinet container.

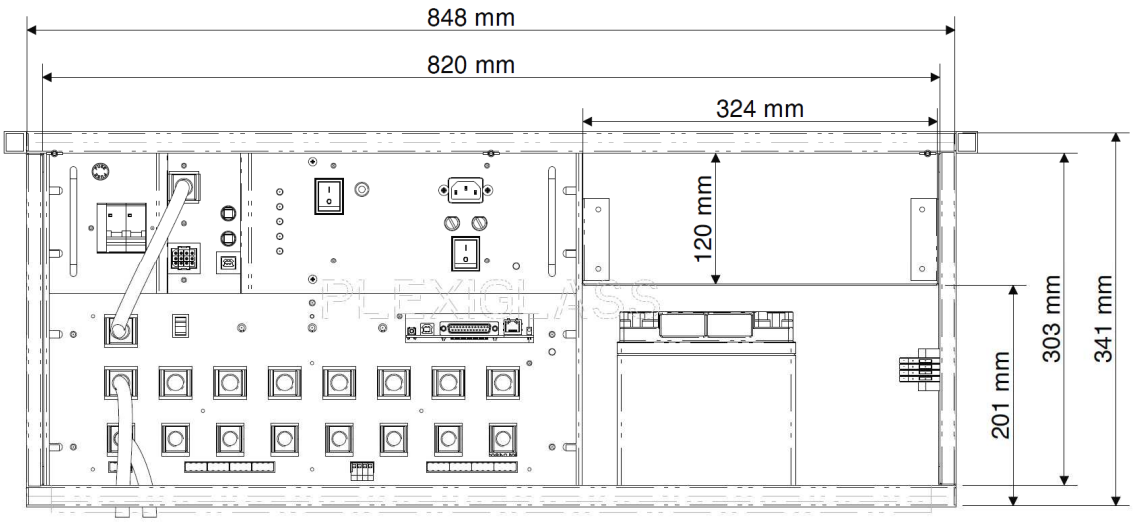


Figure 9 – Front view of the indoor CM–UP Cabinet container

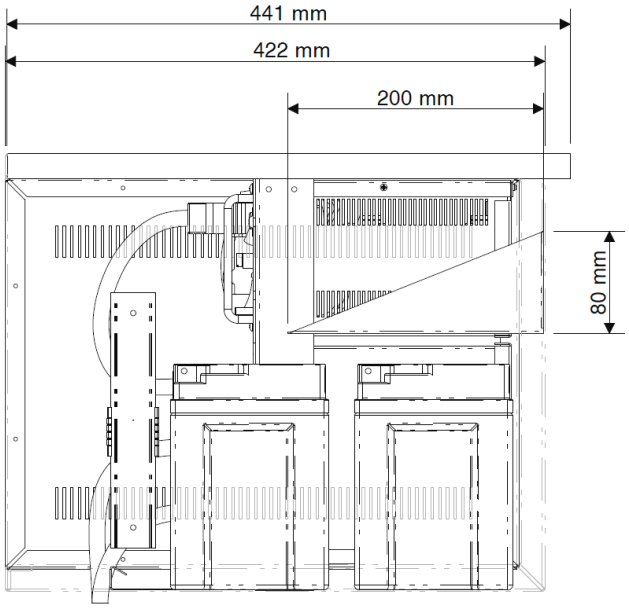


Figure 10 – View of the indoor CM–UP Cabinet container (Side view) whit Plexiglas removable panel.

The outer edge of the upper part of the container must be reinforced with a squared steel profile (minimum size 20mm), fixed to the structure of the container. This profile must be complementary to that of the ceiling fixing support.

5 Equipment

The equipment which must be placed into the container are those that are compliant with the GSTR001/1 specification.

As a function of the particular installation, different equipment can be realized, containing all of or a subset of the following components:

- Power supply/battery charger (PSBC) with accessories;
- UE (either UE8 or UE16 versions) with accessories;
- Batteries;
- Communication module (DCE);
- Ambient temperature probe;
- Terminal board (TB-AUX).

5.1 PSBC

The power supply to be installed is that which is described into the specification GSTR001/1. The assembly will take place on a 19" rack, with screws and cage bolts included in the supply. The overall height is equal to 3U.

5.2 UE

The UE8 to be installed is that which is described into the specification GSTR001/1. The assembly will take place on the 19" rack with screws and cage bolts included in the supply. The overall height is equal to 4U.

5.3 Batteries

The batteries must be compliant with the global specifications on batteries for secondary stations, and they will be housed inside an appropriate compartment.

5.4 Communication module

This module is an integrated device, which can be constituted by either a GSM/GPRS modem or a CPE device, connected to either the UE8 or other Router interfaces, via the standard serial interface. The device allows to connect the RTU to the Central System, through various possible communication networks.

The module is powered via the 12 V_{DC} output, provided for on purpose and derived from the TB–AUX terminal board.

5.5 Ambient temperature probe

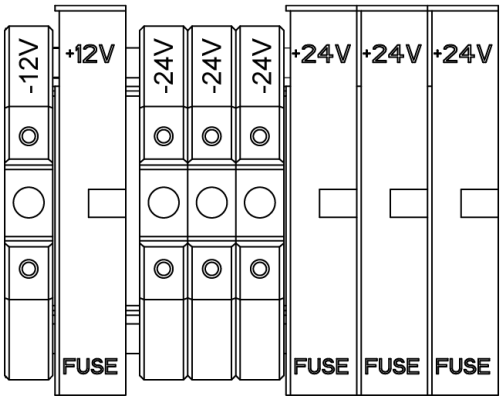
The RTU is equipped with a PT100 type probe (included in the supply), which measures the ambient temperature of the substation, and is connected to the appropriate 4-wire measurement input, namely T_{amb}, by means of a suitable cable (in the supply) of a length equal to 2 m.

This probe has the following features:

- PT100 type probe, compliant with IEC 60751;
- temperature range from -25 ° to + 75 ° C;
- 4-wire connection;
- aerated shaped box for wall-mounting, for indoor use (see figure on the left);

5.6 Cables and terminal board

The terminal board of the auxiliary supplies (TB-AUX) must be mounted on a DIN rail (22mm length, 7mm height), close to the batteries, and must be provided with the pre-wired connection cable to the PSBC (Table 1, Table 2 and Figure 12). The terminal boards to be of type “disconnect terminal blocks” and with screw and provided with fuses. Figure 11 shows the detail of the terminals for the connection of the power supplies and the distribution to other devices. The positive terminals of the power supplies (nr.1 at 12V and nr. 3 at 24V) will be equipped with fuse holders and 2.5 A fuses, on the load side. The terminals must be connected in parallel via a comb-type busbar or pre-wired jumpers.



- **Figure 11 –** Schematic diagram of the supply terminals

All of the terminals of this board must be provided with a screw tightening, for all of the cables with a section equal to 1,5mm^2.

Besides the supply terminal blocks, the rail should allocate the communication device if mounted inside the box.

Pin	Name	Description
1	+ Batt	Battery positive terminal (+24 V_{DC})
2	+ Batt	Battery positive terminal (+24 V_{DC})
3	-Batt	Battery negative terminal (-24 V_{DC})
4	-Batt	Battery negative terminal (-24 V_{DC})
5	+A	Auxiliary power supply
6	-A	Auxiliary power supply
7	+12 V_{DC}	DCE power supply(+12 V_{DC})
8	-12 V_{DC}	DCE power supply(-12 V_{DC})
9	-	-

Table 1 – Pinout (floating and fixed part of the 9 pin connector, power supply side)

All of the terminals must be provided with a screw tightening for cables with a section equal to 1,5 mm^2. the connections to the battery poles, red for the positive and black for the negative, must have: a section ≥ 3mm^2 (2x1,5 mm^2), a length ≥ 80cm and, on the battery side, a collar label indicating the respective polarity and ring terminal connector for screw size M8 assembled in factory.

Pin	Name	Description
1	+12 V_{DC}	DCE power supply (+12V_{DC})
2	-12 V_{DC}	DCE power supply (-12 V_{DC})
3	+ A	Power supply (+24 V_{DC})
4	-A	Power supply (-24 V_{DC})

Table 2 – Terminal board of the auxiliary supplies

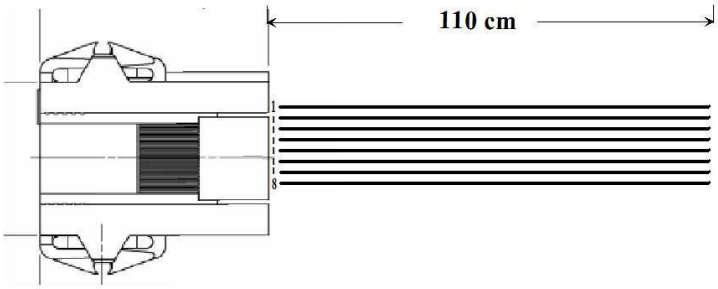


Figure 12 – Connection cable among PSBC, batteries and terminal board of the RTU cabinet container

The grounding braids (4 in total, of equivalent section equal to 16 mm^2), for the connection of the grounding bolts of the individual panels with the grounding bolt which is placed on the container, are included in the supply:

- 3 of a length equal to 1.5 m, which includes the cable terminals, of diameter equal to 6 mm, at both ends:
  - Connection of the battery compartment- bolt on the right side of the container;
  - Connection of the power supply- bolt on the right side of the container;
  - Connection of the UE - bolt on the right side of the container;
- 1 of a length equal to 40 cm, for the grounding connection of the + $24V_{DC}$, including cable terminals, of diameter equal to 6 mm, at one end only.

6 TESTING AND INSPECTION

In addition to the tests prescribed in the GSTR001/1, related to the RTU and the PSBC, the following tests must be executed:

- type tests, with the aim to verify the perfect compliance of a production specimen with the technical specifications detailed in the present document;
- acceptance tests, with the aim to control the essential characteristics of each specimen of the supply.

6.1 Type tests

The supplier must keep and provide ENEL access to the documentation which attests to the success of the execution of the type tests.

6.1.1 Visual inspection

It is mandatory to verify the absence of visible manufacturing defects, the accuracy of construction, the compliance of the dimensions of the cabinet container with those indicated in the present specification, as well as the prescribed IP degree of protection.

6.1.2 Check of all connections

All of the connections of the terminal board must be verified.

The continuity between the TB-AUX terminals and the corresponding pins of the supply cable must be verified, in particular.

6.1.3 Mechanical tests

The tests to be executed on the cabinet container, as well as the methodology of the execution of these tests, are described within the standards recalled in the following

Mechanical test		
(Sinusoidal)Vibration	lower frequency 10 Hz upper frequency 500 Hz acceleration amplitude 10 m/s2 displacement amplitude 0,075 mm	EN 60068-2-6
Vibration, broad-band random (digital control) and guidance		EN 60068-2-64

These tests must be executed with all panels supplied mounted inside.

6.2 Acceptance tests

Within the overall set of type tests, a subset of tests will be selected (i.e. the functionality of the thermoregulation system), useful for the acceptance of each specimen of supply.

For each specimen supplied, a certificate must be provided, which attests to the success in the execution of the acceptance test.

7 Fastening systems

7.1 Wall-mounting

The container is suitable for wall-mounting by dowels of diameter equal to 10 mm (each container must be provided with the drilling jig). The rear of the container must be provided with appropriate spacers, as detailed in Figure 13.

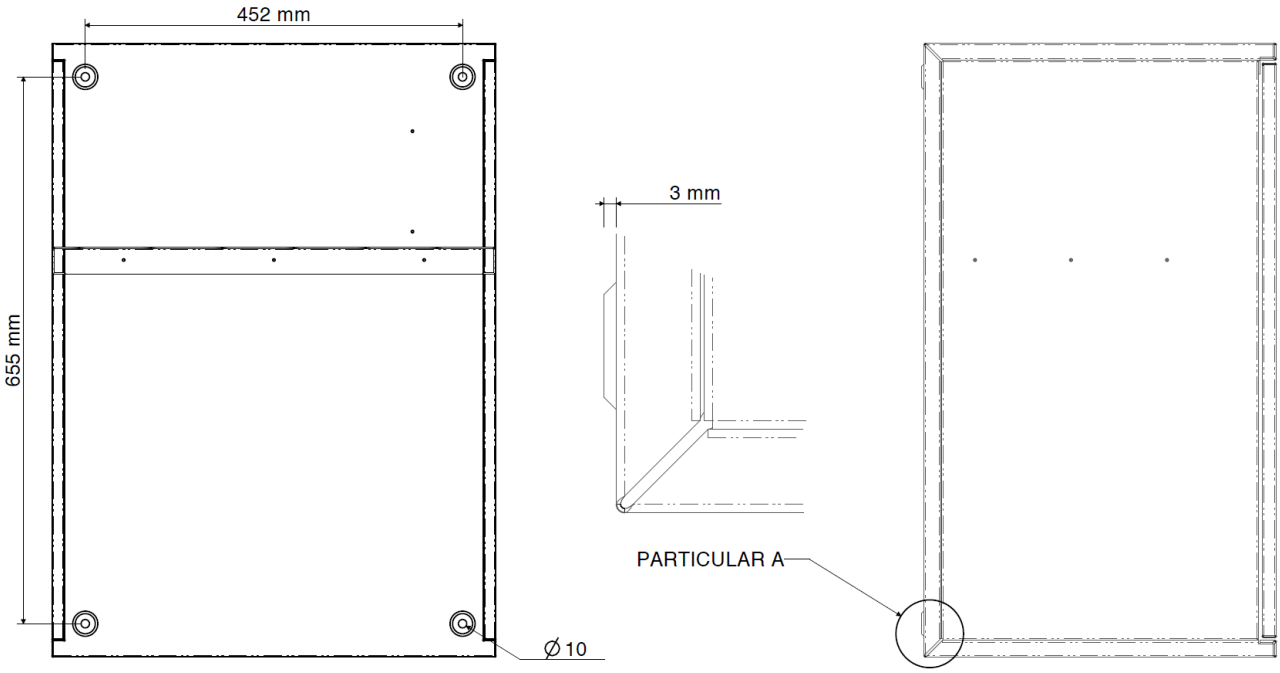


Figure 13 – wall-mounting details

7.2 Ceiling-mounting

The container must be fixed to the ceiling by a C-section steel profile support, previously fixed with dowels of appropriate size. The container will be inserted into the support and fixed by screws to the support itself.

8 Ambient operating conditions

The apparatus provided must be in compliance with the operating conditions listed below:

- Ambient temperature limit in the range of -10 ÷ 55 °C;
- Atmospheric pressure in the range of 70 ÷ 106 kPa;
- Humidity limit of 93% at the max ambient temperature;

- Storage temperature in the range of -25 ÷ 70 °C.

9 Equipment documentation

The provider must produce detailed documentation of the operation, configuration and maintenance of the equipment, accompanied by either the wiring and topographic diagrams, or the lists of components. These documentation must be provided electronically.